

High-Definition Multimedia Interface

Version 2.0

Quantum Data MOI v1.1

Test ID: HF1-51

May 12, 2015

Preface

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1.1 May 12, 2015 - Update to reflect approval date.

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Contact Information

The URL for the HDMI Forum web site is: <http://www.hdmiforum.org/>

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Introduction

This document provides a set of Method of Implementation for test method described in HDMI Compliance Test Specification Version 2.0 (HDMI CTS 2.0). HDMI Forum created HDMI CTS 2.0 to specify a set of tests that should be performed to verify features described in HDMI Specification Version 2.0.

Scope

This document provides testing procedures for HDMI CTS 2.0 Test ID HF1-51: “Source AVI Infoframe for Y420VDB and Y420C MDB Tests.” The procedure below deals with single resolution and only one Test ID is considered at a time.

References Document

Normative References

High-Definition Multimedia Interface Specification Version 1.4b, October 11, 2011.
HDMI Compliance Test Specification Version 1.4b, October 11, 2011.
High-Definition Multimedia Interface Specification Version 2.0, August, 2013.
HDMI Compliance Test Specification Version 2.0.
HDMI 2.0 Generic Compliance Test Specification Version (GCTS), Version 2.0a, August 5, 2014.

Informative Reference

No additional informative references.

Test ID HF1-51: Source AVI Infoframe for Y420VDB and Y420CMDB Tests

Objective

Confirm that the YC_BCr 4:2:0 signaling information in the AVI infoframe is correct.

Table 7-93 Source AVI Infoframe for Y420VDB and Y420CMDB Requirements

Reference	Requirement
[HDMI 2.0: 7.1]	"A Source shall not send a Video Format with YCBCR 4:2:0 Pixel Encoded data to a Sink that does not indicate support for such format."
[HDMI 2.0: 7.1.2]	"When a Source sends YCBCR 4:2:0 Pixel encoded data across an HDMI cable, the Y2, Y1, and Y0 fields of the AVI InfoFrame shall be set Y2 = 0, Y1 = 1 and Y0 = 1, as defined in CEA-861-F Section 6.4 and CEA-861-F Table 9."
CEA 861-F, Section 6.2	<See reference for details on AVI Infoframe>

Capability(s)

The Source DUT supports at least one Video Format in YC_BCr 4:2:0 color sampling mode.

Test Equipment

Item	Generic Equipment	Vendor Specific Equipment	Quantity
1	DDC Slave Emulator	980 Advanced Test Platform series:	1
2	EDID Emulator	980 HDMI Protocol Analyzer module	1
3	594MHz Video Protocol Analyzer w/ YC _B Cr 4:2:0 option	HDMI CTS 2.0 Compliance Test Package #3	1

Generic Procedure

- 1 If the CDF field Source_HDMI_YCBCR_420 is "N", then SKIP this test.
- 2 Connect the Source DUT to a 594MHz Video Protocol Analyzer with the DDC Slave Emulator and EDID Emulator.
- 3 Program the EDID Emulator to reveal an EDID containing the following:
 - 3.1 YCBCR 4:2:0 Video Data Block with:
 - 3.1.1 YC_BCr 4:2:0-only with SVDs = 96, 97, 101, 102, 106 and 107 (NOTE: If a regular Video Data Block is also present, then it shall not contain SVDs = 96, 97, 101, 102, 106, or 107)
 - 3.1.2 No HF-VSDB shall be included.
- 4 Operate the Source DUT to output a 24-bit/Pixel YC_BCr 4:2:0 Pixel encoded signal at a Video Format for which it supports 4:2:0 transmission (see CDF field

Source_HDMI_YCBCR_420), repeating all of the following tests for at least one of the supported Video Formats.

- 5 Perform the AVI InfoFrame (HB0, HB1 = 0x82, 0x02) test.
 - 5.1 If the AVI InfoFrame does not occur at least once per two Video Fields, then FAIL.
 - 5.2 If PB1 bit 7, bits 6 and 5 (Y2, Y1, Y0 fields) does not equal to 011b, then FAIL.
 - 5.3 If PB4 (VIC7, VIC 6, VIC 5, VIC 4, VIC 3, VIC 2, VIC 1, VIC 0) does not equal to one of 96, 97, 101, 102, 106 or 107, then FAIL.
 - 5.4 If bytes PB14 through PB27 are not equal to 0, then FAIL.
 - 5.5 If PB5 bit3···0 (PR 3···0) does not equal to 0000b, then FAIL.
- 6 Program the EDID Emulator to reveal an EDID containing the following and repeat steps 4 and 5 above. (Note that, Step 5.2 shall be replaced with “If PB1 bit 7, bits 6 and 5 (Y2,Y1,Y0 fields) does not equal to 000b, 001b, 010b or 011b, then FAIL.”:
 - 6.1 Video Data Block with SVDs for 96, 97, 101, 102, 106 and 107 (NOTE: YCBCR 4:2:0 Video Data Block shall be removed).
 - 6.2 YCBCR 4:2:0 Capability Map Data Block with a Capability Bit Map where the bits corresponding to SVDs for 96, 97, 101, 102, 106 and 107 are set (=1).
 - 6.3 HF - VSDB indicating a Max_TMDS_Character_Rate = 119 (595Mcsc), SCDC_Present = 1, and no deep color 4:2:0 support shall be included.
- 7 Program the EDID Emulator to reveal an EDID containing the following and repeat steps 4 and 5 above. (Note that, Step 5.2 shall be replaced with “If PB1 bit 7, bits 6 and 5 (Y2, Y1,Y0 fields) does not equal to 000b, 001b, 010b or 011b, then FAIL.”:
 - 7.1 All of the VICs 96, 97, 101, 102, 106 and 107 as SVDs in the Video Data Block.
 - 7.2 A YCBCR 4:2:0 Capability Map Data Block (length-field=1, no YCBCR 4:2:0 Capability Bit Map).
 - 7.3 HF - VSDB indicating a Max_TMDS_Character_Rate = 119 (595Mcsc), SCDC_Present = 1, and no deep color 4:2:0 support shall be included.
- 8 Program the EDID Emulator to reveal an EDID containing:
 - None of the VICs 96, 97, 101, 102, 106 and 107 as SVDs in the Video Data Block.
 - No YCBCR 4:2:0 Video Data Block.
 - No YCBCR 4:2:0 Capability Map Data Block.

- 9 Operate the Source DUT to output a YCbCr4:2:0 Pixel encoded signal at one of the Video Formats for which it supports 4:2:0 transmission (see CDF field Source_HDMI_YCbCr_420_Video_Formats).
 - 9.1 If PB1 bit 7, bits 6 and 5 (Y2, Y1, Y0 fields) of transmitted AVI InfoFrame equals to 011b, then FAIL.

Vendor Specific Test Procedure

Test Equipment

A variety of equipment is needed for testing HDMI products. Each piece is authorized and included by name in this Compliance Test Specification. This section describes the Quantum Data test equipment.

HDMI Protocol Analyzer module

The Quantum Data 980 HDMI Protocol Analyzer module can be installed in any of the 980 series Advanced Test Platforms. This 980 HDMI Protocol Analyzer module serves the generic test functions called out in the HDMI 2.0 Generic CTS. Refer to the table below:

Item	Quantum Data Equipment	
1	980 Advanced Test Platform series:	
	Equipped with:	980 HDMI 2.0 Protocol Analyzer module
		HDMI CTS 2.0 Compliance Test Package #3

980 HDMI 2.0 Protocol Analyzer Module with 980 Series Platform Configurations

The figures below show depictions of the 980 HDMI 2.0 Protocol Analyzer module equipped in various 980 series platforms. **Note:** Card positioning may vary depending on configuration.



Source AVI Infoframe for Y420VDB and Y420CMDB

Test ID HF1-51 - Source AVI Infoframe for Y420VDB and Y420CMDB Tests

1. Objective

Confirm that a YCbCr 4:2:0 signaling information in the AVI infoframe is correct. The test verifies that when a source sends YCbCr 4:2:0 pixel encoded data it also sends the proper information in the AVI Infoframe.

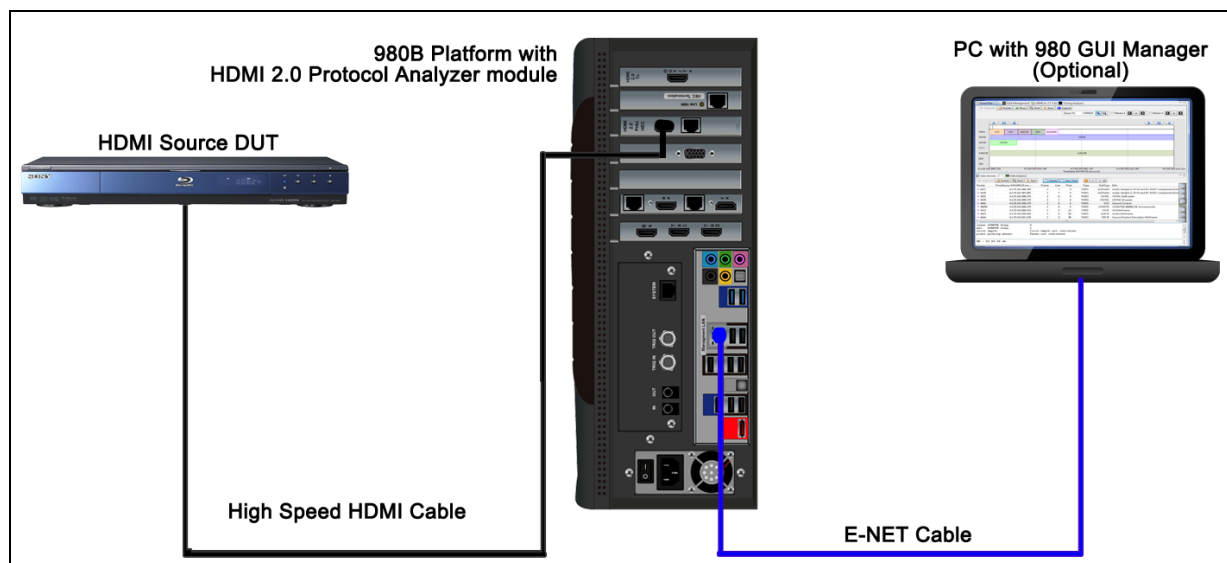
2. Test Overview

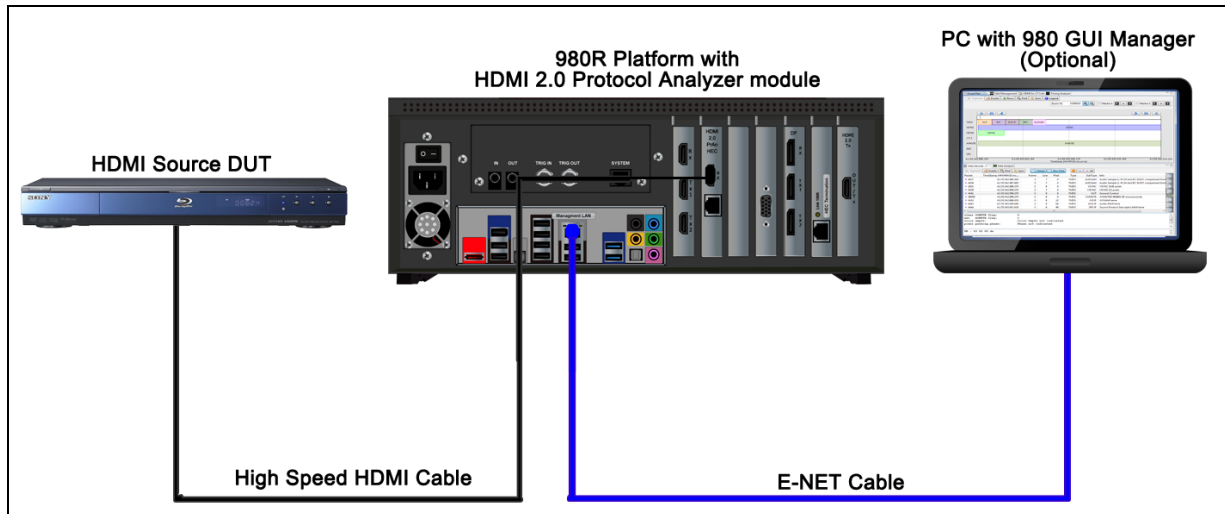
This test is run for one YCbCr 4:2:0 compliant format timing with various EDID configurations. The 980 HDMI 2.0 Protocol Analyzer's Compliance Test application automatically provisions the EDID configurations to facilitate the test. The Pass/Fail criteria is assessed by the application with no human examination required.

3. Procedure

Use the following procedure to conduct this test.

- 1 Connect Source DUT to the Quantum Data 980 HDMI 2.0 Protocol Analyzer at the module's port labeled Rx. Use a High Speed HDMI cable. The figures below show depictions of connections to the 980 HDMI 2.0 Protocol Analyzer module residing in various 980 series chassis.

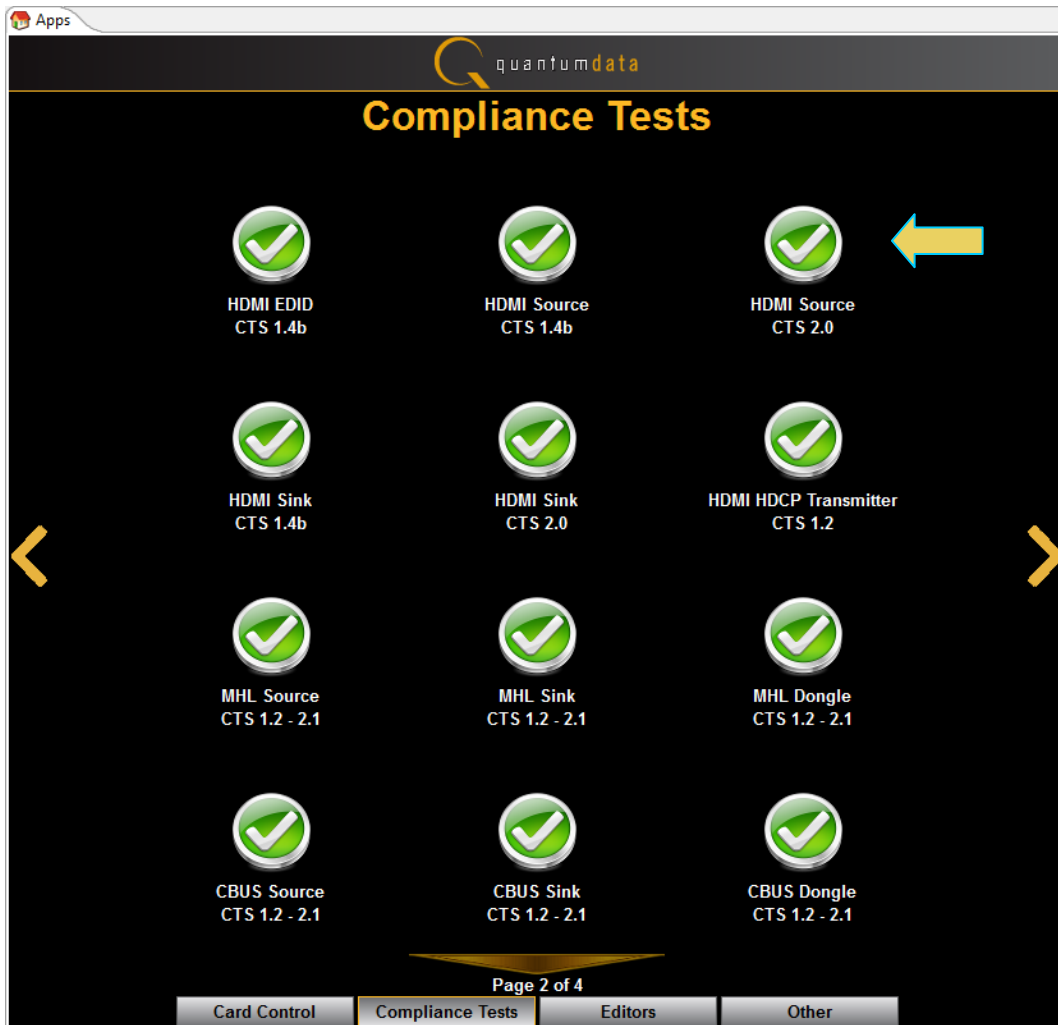




- 1 Operate the Source DUT to output a YCbCr 4:2:0 Pixel encoded signal at a Video Format for which it supports YCbCr 4:2:0 transmission.
- 2 Use Quantum Data 980 Embedded Manager GUI (touchscreen) or invoke Quantum Data 980 External Manager GUI (Windows application).

Note: You will not need to connect the PC shown in the figures above if you are running the compliance test through the 980's embedded display. The PC running the 980 HDMI 2.0 Protocol Analyzer module's compliance test application is connected to the 980 through a standard Ethernet cable.

- 3 Complete the following steps:
 - 3.1 Click on the HDMI Source CTS 2.0 icon in the Compliance Tests page of the Apps panel.



- 3.2 Navigate to the CDF tab if not already there. If there is a saved CDF file, then click on Open and select it. Otherwise, enter the DUT's CDF information for the General sub tab and the Y420 sub tab and the 6G Video sub tab and optionally click on Save to save the CDF.

HDMI 2.0 Src CT 2.0

CDF Entry **Test Selection** Test Options / Preview

Open New Save CDF File: <not saved>

General Y420 Video **7) Video** 6G Video non2160p Timings

Source_HDMI_YCBCR_420 Does the DUT support YCBCR4:2:0 Pixel encoding transmission?
☒ Yes ☐ No

Source_HDMI_YCBCR_420_Test_Image Does the DUT support the generation of the prescribed test images for YCBCR4:2:0 Pixel encoding transmission?
☐ Yes ☒ No

Source_HDMI_YCBCR_420_DC10 Does the DUT support YCBCR 4:2:0 Deep Color Pixel encoding with 10-bits per component?
☐ Yes ☒ No

Source_HDMI_YCBCR_420_DC12 Does the DUT support YCbCr 4:2:0 Deep Color Pixel decoding with 12-bits per component?
☐ Yes ☒ No

Source_HDMI_YCBCR_420_DC16 Does the DUT support YCbCr 4:2:0 Deep Color Pixel decoding with 16-bits per component?
☐ Yes ☒ No

Source_HDMI_YCBCR_420_BT2020_YCC Does the DUT support YCC 4:2:0 Pixel encoding in BT.2020 Y'C'BC'R Colorimetry?
☐ Yes ☒ No

Source_HDMI_YCBCR_420_BT2020_cYCC Does the DUT support YCC 4:2:0 Pixel encoding in BT.2020 Y'CC'BCC'RC Colorimetry?
☐ Yes ☒ No

Source_HDMI_YCBCR_420_Video_Formats

(96) 3840x2160p @ 50 Hz 16:9	<input type="checkbox"/> 24 <input type="checkbox"/> 30 <input type="checkbox"/> 36 <input type="checkbox"/> 48 (bits per pixel)
(97) 3840x2160p @ 60 Hz 16:9	<input checked="" type="checkbox"/> 24 <input type="checkbox"/> 30 <input type="checkbox"/> 36 <input type="checkbox"/> 48 (bits per pixel)
(101) 4096x2160p @ 50 Hz 256:135	<input type="checkbox"/> 24 <input type="checkbox"/> 30 <input type="checkbox"/> 36 <input type="checkbox"/> 48 (bits per pixel)

Close

HDMI 2.0 Src CT 2.0

CDF Entry **Test Selection** Test Options / Preview

Open New Save CDF File: <not saved>

General Y420 Video 21:9 (64:27) Video **6G Video** non2160p Timings

Source_ITURBT_2020_101 Does the DUT support ITU-R BT.2020 Y'CC'BCC'RC Colorimetry?
☐ Yes ☒ No

Source_ITURBT_2020_110 Does the DUT support ITU-R BT.2020 Y'C'BC'R Colorimetry?
☐ Yes ☒ No

Source_LTE_340Mscs_Scrambling Does the product support scrambling for TMDS Character Rates at or below 340Mscs?
☐ Yes ☒ No

Source_Above_340 Does the product support any Video Format/color mode for TMDS Character Rate above 340Mscs up to 600Mscs?
☒ Yes ☐ No

Source_2160p_Video_Formats_Above_340

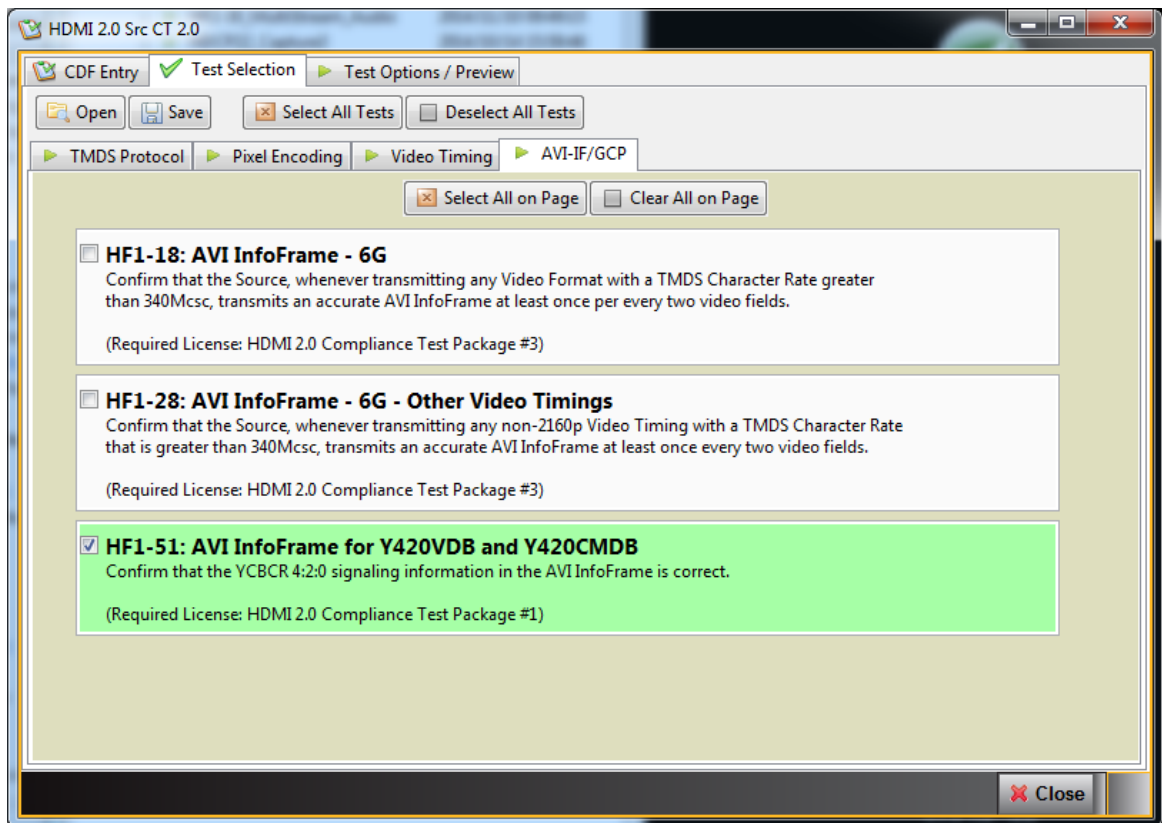
(96) 3840x2160p @ 50 Hz 16:9	<input type="radio"/> Yes <input checked="" type="radio"/> No
(97) 3840x2160p @ 60 Hz 16:9	<input checked="" type="radio"/> Yes <input type="radio"/> No
(101) 4096x2160p @ 50 Hz 256:135	<input type="radio"/> Yes <input checked="" type="radio"/> No
(102) 4096x2160p @ 60 Hz 256:135	<input type="radio"/> Yes <input checked="" type="radio"/> No
(106) 3840x2160p @ 50 Hz 64:27	<input type="radio"/> Yes <input checked="" type="radio"/> No
(107) 3840x2160p @ 60 Hz 64:27	<input type="radio"/> Yes <input checked="" type="radio"/> No

Source_2160p_DC_Video_Formats_Above_340

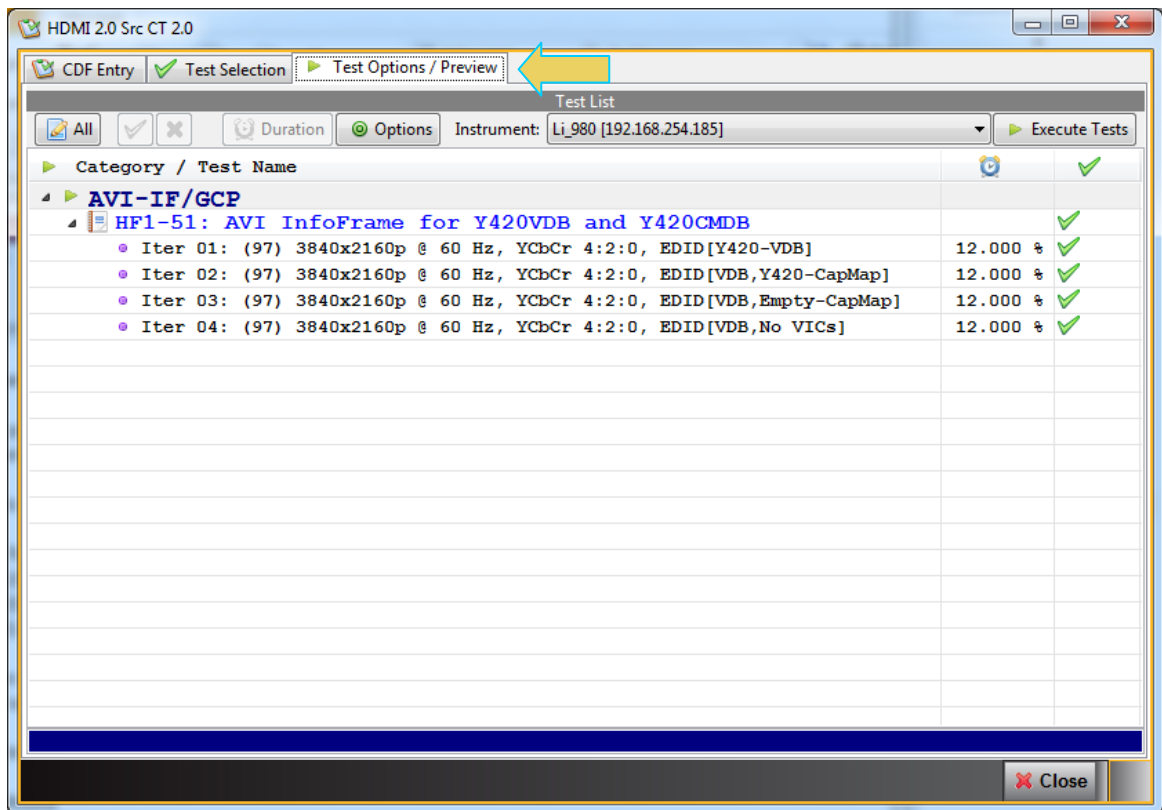
(93) 3840x2160p @ 24 Hz 16:9	<input type="checkbox"/> 30 <input type="checkbox"/> 36 <input type="checkbox"/> 48 (bits per pixel)
------------------------------	--

Close

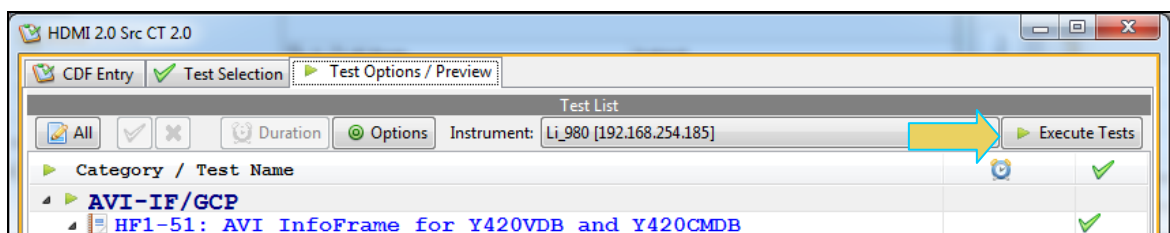
- 3.3 Click on the Test Selection AVI InfoFrame tab, and select the HF1-51 Source AVI InfoFrame for Y420VDB and Y420CMDB Tests. Refer to the screen example below.



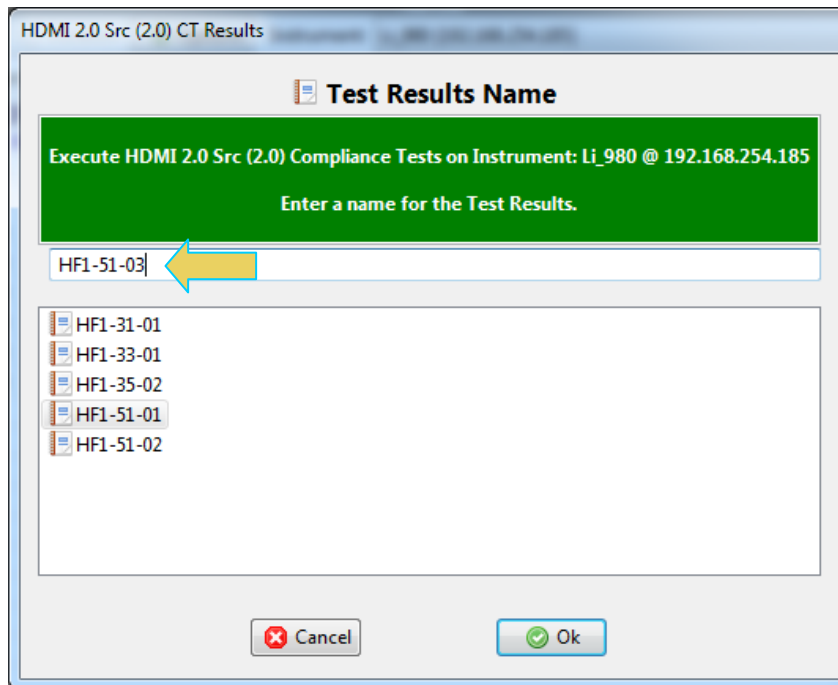
- 3.4 Click on Test Options / Preview tab and review the list of tests. Refer to the screen example below.



3.5 Click on Execute tests activation button to initiate the test. Refer to the screen example below.

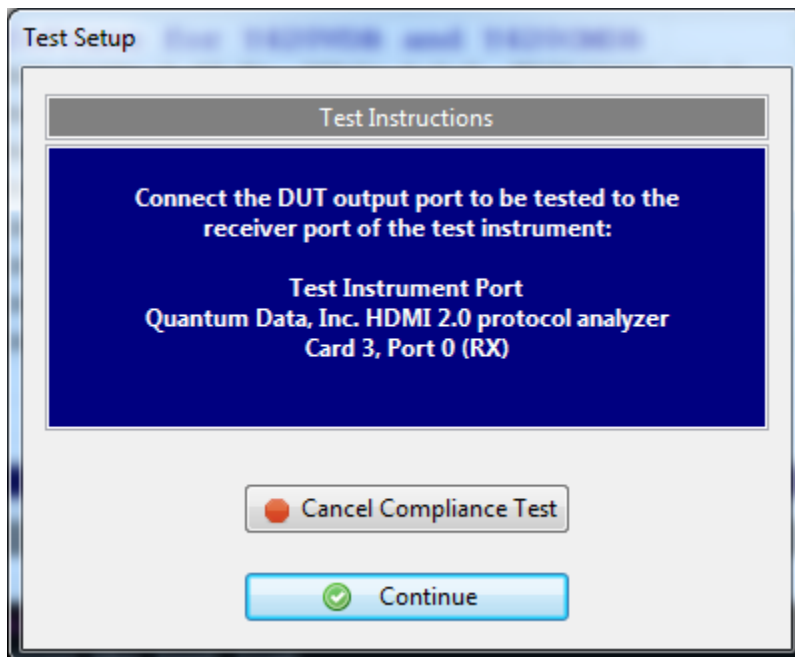


Note: You will be prompted with a dialog box to assign a name to the test results. Refer to the screen example below:

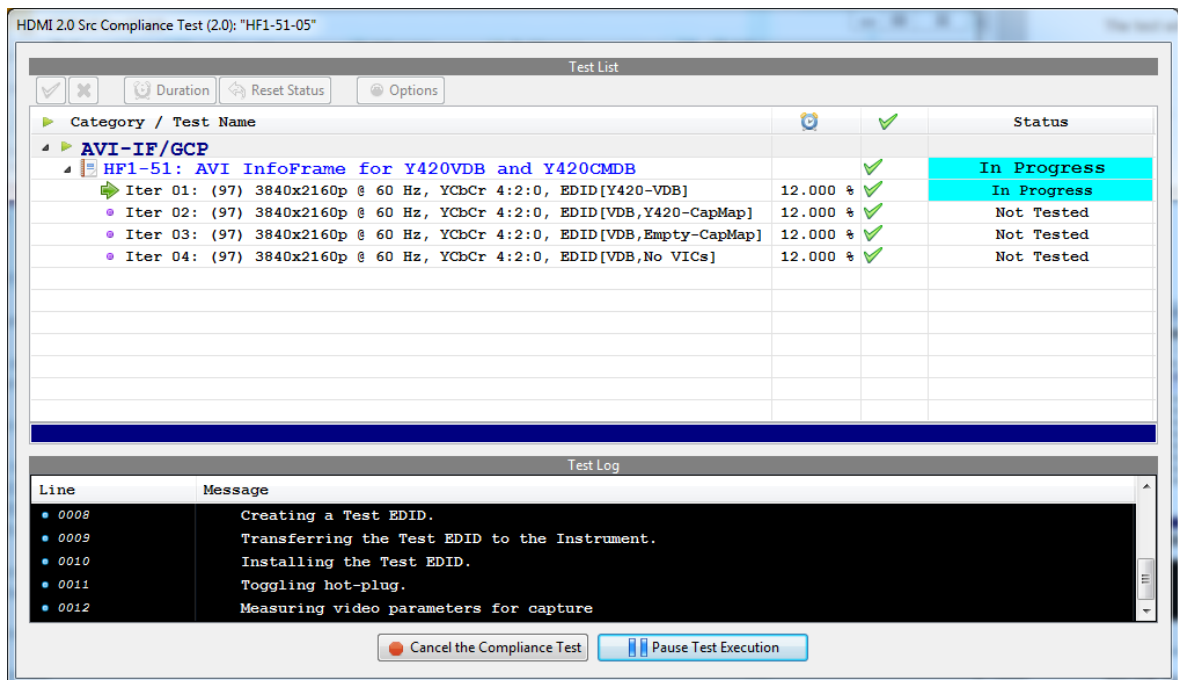


Enter a name and the test will begin.

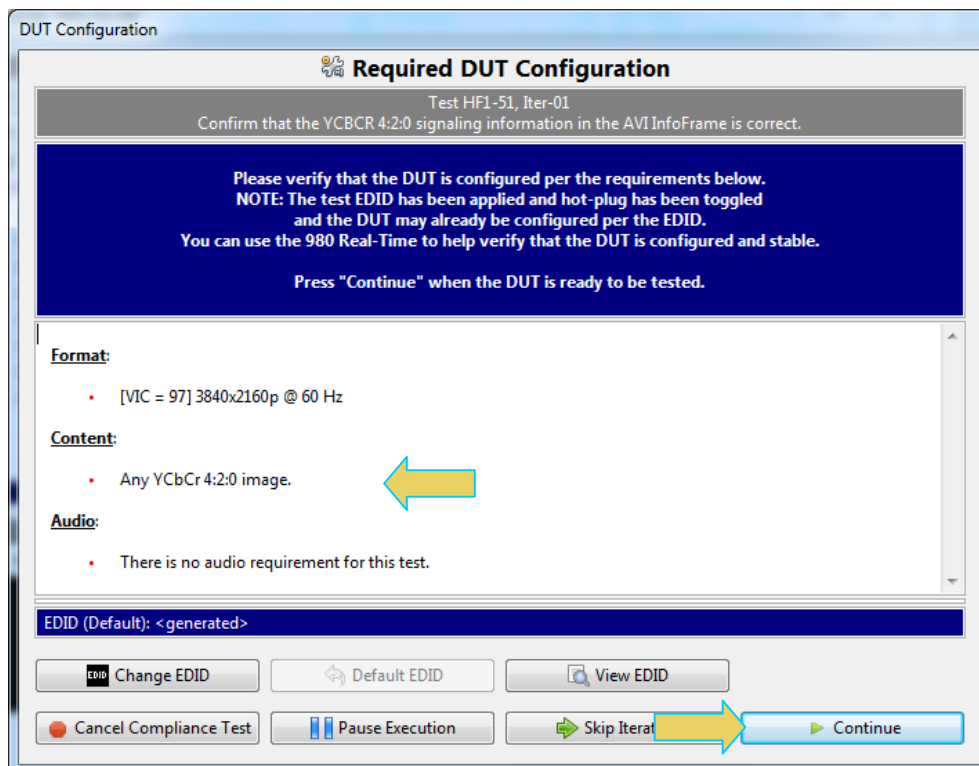
You will be prompted with a dialog box describing the test setup. Click on Continue when the device under test is connected to the test equipment properly.



The test will start and a new Test Window will appear as shown below.



You will be prompted with dialog boxes informing you of the requirements of the DUT. Verify that the source is outputting the required HDMI format and pixel encoding in each case and press Continue to run the test.



- 4 When the test is complete a Test Results screen appears. Refer to the screen example below.

If the 980 HDMI Protocol Analyzer's compliance test application reports PASS, then PASS.
If the 980 HDMI Protocol Analyzer's compliance test application reports FAIL, then FAIL.

